ADW-BW
Twelve Component Batch Weighing Controller

A Supplement to be read in conjunction with the ADW15 User Manual

THE QUEEN'S AWARDS
FOR ENTERPRISE
2009

User Manual
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Contents

ADW-BW 12 Component Batch Weigher

Designed around the highly successful Mantraweigh ADW15, Strain gauge Amplifier/Controller, and Remote Multi Set Point system; The ADW-BW Batch Weigher special software program, makes provision for the weighing and mixing of up to 12 components. An option is available to select from 10 possible menus using an additional I/O module and BCD switch.

Programming for the system parameters is achieved by the ADW15 keypad, with an option to carry out the operation via communications port from a remote PC or PLC.

Ingredients mix times, weight checks, settle times and tolerance settings are all features of this comprehensive software program. To ensure system integrity, activities are constantly monitored with an Alarm condition being activated where appropriate.

Very simple auto-calibration routines make this an extremely easy system to set up.

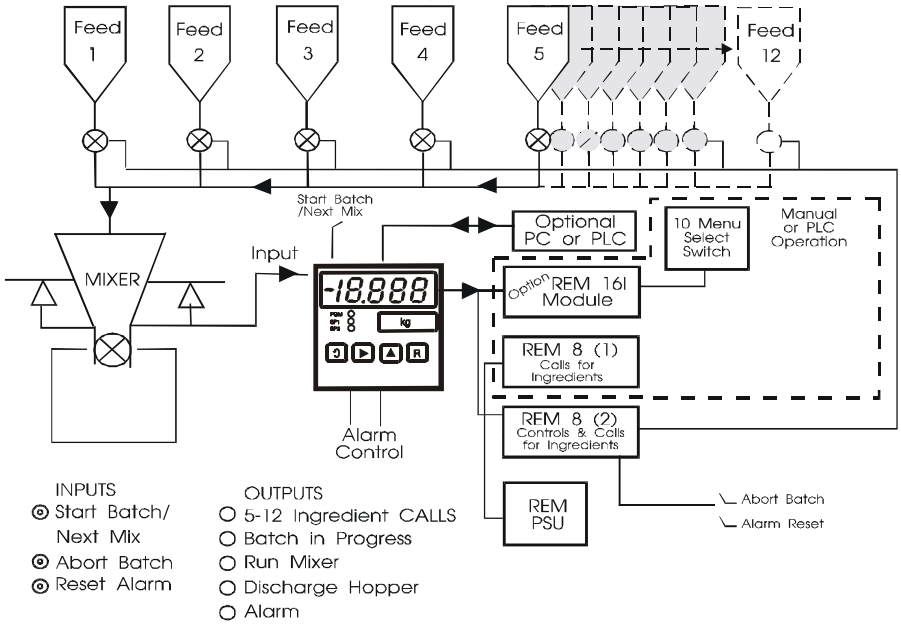
All batch details and weights will be recorded on an optional printer if necessary.

The Batch Weigher is part of a family of special Weighing, Filling and Throughput Control Systems offered by Mantracourt Electronics Limited.

ADW-BW Component Batch Weighing Controller

features

- ☑ Upto 12 Components
- ☑ Inflight compensation for all components
- ☑ Selectable batch totals
- ☑ Manual or PLC operation
- ☑ Password security
- ☑ Din rail relay module contact rating 240V @ 5A AC
- ☑ Optional 10 Menu selection
- ☑ Easy calibration
- ☑ Mixer timing
- ☑ Panel display sealed to IP65
- ☑ Excitation for up to 4 strain gauges



Options	**Accessories**
Supplies for 110/240 VAC or 12/24 VDC Communications Port PLC or PC Printer Drive Menu Selection	IF25 Interface Module Connects up to 25 Batch Weighing Controller to one RS232 port

Introduction

Designed around the ADW15 Strain gauge Indicator Controller, and the remote set point relay unit.
The batch controller system software makes provision for the mixing of up to 12 components
In 10 possible menus (see options). Programming from the ADW-BW, keypad allows for the control of quantities from each of the feeds, and the number of batches required.

Ingredient mix times, weight checks, and settle times are all features of the comprehensive software control within the ADW-BW.

With the inclusion of interface boards, full remote control can be affected from a PC or PLC, and a printed record of all the required activity can be taken onto a printer.

Specifications

Operating Instructions for Batch Weighing Controller

Mnemonics Available

Code	***Value***	***Description*** Selected recipe
REP	1-10	Security password for entry to the following data, set in EEPROM
PASS	1111	Set point 1 upto 12 'Desired' trip level of outputs
SP1 upto 12	±19999	In-flight compensation for SP 1 to 12
IF1 upto 12	±19999	Actual trip points = SP - IF
bt	1-255	Batch total. Sets total number of batches
tl	0-19999	Mixing time set in seconds
CALL	±19999	Display value for 'Low' auto calibration point, must be less than 'CALH'
CALH	±19999	Display value for 'High' auto calibration point.
dA	0-31	Input averaging & options selection +8= BW5, +16 = 10 menu
dP	0-5	Selects decimal point position
Sttl	0-255	Settle time before auto tare of next ingredient, set in seconds
t0L	0-19999	Tolerance Settings - To check mixer hopper has discharged before allowing next batch to start
bdt	1-255	Delay time before checking increase in weight on call for product. Set in seconds
IIt	1-255	Increase in weight check time interval. Set in seconds 1->255 Increase in weight
ICA	1-19999	check amount i.e. the display must increase in weight check time interval. (1It).Set in engineering units
Cp	0-129	Comms protocol 0-127 = Printer, 128 = 'MANTRABUS Format'
SdSt/Lab	0-254	Serial device station number to set the units 'address' when the communications port is used.
rS	0-255	Sets display resolution

Batch Controller System Description

The Batch Controller is based upon the strain gauge indicator controller ADW15 and the REM 8 multi set point DIN rail units.

A special software program in the ADW15 makes provision for the mixing of up to 12 components into one mixing vessel.

Each of the components is controlled by values selected under mnemonics entered from the keypad of the ADW-BW.

A BCD switch with REM16I allows for the selection of up to 10 menus. The range of mnemonics include Set Points and In-flight compensation valves which, when programmed set the conditions for a relay to operate, controlling the operation of valves and therefore the amount of component from each feed into the mixer/weigh vessel.

A batch control mnemonic 'bt' provides a batch total which controls the desired number of mixes from the components feeds. This value can be set from 1 to 255 batches.

The components mix time can be set from between 0 to 19999 seconds, by the setting of the mnemonic 'tl', before a discharge is activated.

Auto calibration of the ADW15 controller is achieved by 'low' and 'high' calibration point settings.

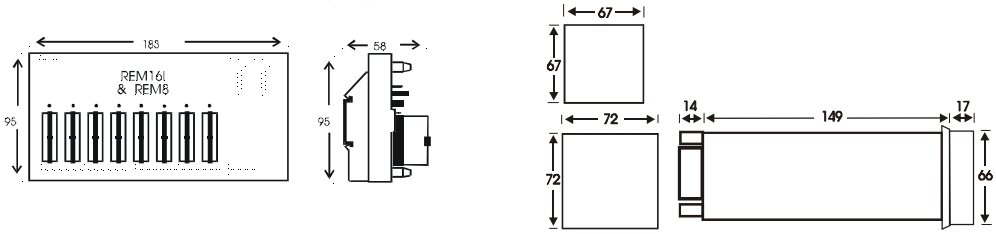
Further mnemonics allow for a display averaging and decimal point position, and settle time figure before call of the next component.

ADW-BW Indicator Controller

Calibration	Automatic digital by use of keypad and 1 (or 2) known weights. Manual calibration can also be selected
Sensitivity	± 0.95 to 3.8mV/V for full scale. (Factory set to 2.5mV/V.) User analogue calibration if required by link change and 15 turn trimmers
Excitation	10V d.c. nominal, 150mA maximum
Compensation	By ± sense wire to compensate for cable, connection volt drops and any variation in 10V supply
Accuracy	90 days ± 0.08% of reading ± 0.05% of FSD typical
Drift	0.002%/°C typical @ 2.5mV/V
Display Rate	0.1 seconds for standard update
Input Average	Set by keypad, up to 64 standard updates
Display	1 x 4.5 digit, High brightness, 10mm Red LED 2 x 3mm LED's for SP1 and SP2 status 1 x 3mm LED for hold

The Relay Output Module

The module consists of 8 relays rated at 240 volts 5 Amps - SPCO, Alarm via 30V 50mA NC contact, DIN rail mounted for a G or top hat profile. Each relay is plugg-able and connections are made by 2.5mm field screw terminals. Indication of relay status is shown by LED's. Trip points volt free contact. The module can be situated up to 2 metres from the ADW strain gauge indicator controller.



Supplement To be read in conjunction with ADW15 user Manual

Set Up Parameters

1 Enter the password to proceed with set up parameters.

2 i) Enter system parameters i.e. 5 or 12 Components under (DA) as follows:-

DA	0 - 7	=	12 components + display averaging
DA	8 -15	=	5 components + display averaging
DA	16 -23	=	12 components + menu select + display averaging
DA	24 - 31	=	5 components + menu select + display averaging

Note: The selection of 5 components reduces the menu size to SP1-5 and IF1-5

ii) Enter required set point values for SP1 to SP12

iii) Enter batch total required (bt)- must be 1 or greater

iv) Enter mixing time in seconds (tL)

v) Enter the settle time in seconds (Sttl)

vi) Enter Tolerance settings for mixer hopper empty (tol)

vii) Enter delay time before, increase in weight check (bdt)

viii) Enter increase in weight check timer interval in seconds (Ilt)

ix) Enter increase in weight amount (ICA)

Calibration settings CALL and CALH together with auto tare, display, averaging and decimal point selection can be set independently of the controller system as described in the ADW15 user manual.

In Flight values (IF1-IF12) should be determined after running an initial batch.

Hardware Configuration

Relays RL1 to RL8 of REM8 (1) and RL1 to RL4 of REM8 (2) operate the set points SP1 to SP12 (and corresponding in flight IF1 to IF12), as required for the number of components in the mix. Components can be omitted by setting their corresponding SP values to zero.

Relay RL6 of REM2 operates the mix time running.
Relay RL7 of REM2 operates the discharge.
Relay RL8 of REM2 operates the batch in progress.

Procedure

1. Start signal from 'reset' terminals on the ADW-BW. (This doubles as start batch and start mix contact).

2. The batch in progress relay (RL8) operates, the ADW15 auto tares and calls for the first component. The first set point relay operates (e.g. SP1 = RL1 relay).

3. When SP1 is achieved, the relay drops out and after the programmed settle time, the unit auto tares and the next relay operates (e.g. SP2 = RL2 relay).

4. When SP2 is achieved, the relay drops out and after the programmed settle time, the unit auto tares and the next relay operates (eg SP3 = RL3 relay).

The sequence is repeated for up to 12 components as required.
If the set point = 0 then that relay is omitted

5. On completion of the discharge i.e. the container weight returned to zero, within the tolerance programmed, 'tol' the relay R7 drops out.

6. The system will now be ready for a further mix to take place. This is achieved by a further press of the start batch/next mix contact, the unit auto tares and the sequence is repeated.

7. On completion of the last mix, the start batch/next mix contact is again pressed to acknowledge that the batch is complete. The batch in progress relay now drops out.
   This completes the batch sequence.

Alarm Conditions

(Defined as contacts open on SP3 via AN+/AN- on the ADW15 rear panel)

1. Loss of communications to the REM units will cause the display to flash at a rate of once per second. This is a self cancelling alarm.

2. A 'NO' increase in weight as determined by 'IIt and ICA' after the time programmed for 'bdt', will cause an alarm (This alarm will be cancelled if the component reaches its set point value).

3. An alarm reset is achieved by a contact closure on input1 of the J4 on the REM8.

4. An 'ABORT FUNCTION' function is achieved by a contact closure on input 2 of J4 on the REM8. This will remove all 'CALLS' leaving the ADW-BW waiting to discharge its contents if the ADW-BW, is however, running the mix time, then this time will finish before discharging. On discharge being complete a 'NEXT FILL/START ' signal will cancel the batch in progress relay.

Note: *i)* *When a mixing sequence is in operation, it is not possible to enter the menu*

ii) *The alarm condition is achieved by the SP3 contact board replacing the analogue output connections on the rear of the ADW15*

iii) *The minimum system hardware requirement is:*

1 x ADW-BW
1 x REM8
1 x REM PSU
1 x REM C1 cable
(See option 1. Diagram for details)

Communications to be read in Conjunction with Chapter 7 of the ADW15 User Manual

DEC	HEX	Description	
1	1	REQUEST ALL VARIABLES	(AS ADW15)
2	2	REQUEST DISPLAY DATA	(AS ADW15)
3	3	INHIBITED RETURN NAK	(rEC)
4	4	UPDATE SET POINT 1	(SP1)
5	5	UPDATE IN-FLIGHT 1	(IF1)
6	6	UPDATE SET POINT 2	(SP2)
7	7	UPDATE IN-FLIGHT 2	(IF2)
8	8	UPDATE SET POINT 3	(SP3)
9	9	UPDATE IN-FLIGHT 3	(IF3)
10	A	UPDATE SET POINT 4	(SP4)
11	B	UPDATE IN-FLIGHT 4	(IF4)
12	C	UPDATE SET POINT 5	(SP5)
13	D	UPDATE IN-FLIGHT 5	(IF5)
14	E	UPDATE SET POINT 6	(SP6)
15	F	UPDATE IN-FLIGHT 6	(IF6)
16	10	UPDATE SET POINT 7	(S7)
17	11	UPDATE IN-FLIGHT 7	(IF7)
18	12	UPDATE SET POINT 8	(SP8)
19	13	UPDATE IN-FLIGHT 8	(IF8)
20	14	UPDATE SET POINT 9	(SP9)
21	15	UPDATE IN-FLIGHT 9	(IF9)
22	16	UPDATE SET POINT 10	(SP10)
23	17	UPDATE IN-FLIGHT 10	(IF10)
24	18	UPDATE SET POINT 11	(SP1)
25	19	UPDATE IN-FLIGHT 11	(IF11)
26	1A	UPDATE SET POINT 12	(SP12)
27	1B	UPDATE IN-FLIGHT 12	(IF12)
28	1C	UPDATE BATCH TOTAL	(bt)
29	1D	UPDATE MIXER TIMER	(t1)
30	1E	INHIBITED. RETURNS A 'NAK'	
31	1F	INHIBITED. RETURNS A 'NAK'	
32	20	INHIBITED. RETURNS A 'NAK'	
33	21	INHIBITED. RETURNS A 'NAK'	
34	22	UPDATE DISPLAY AVERAGES	(DA)
35	23	UPDATE DECIMAL POINT	(DP)
36	24	UPDATE SETTLE TIME	(ST)
37	25	UPDATE TOLERANCE FOR RETURN TO START WEIGHT	(TOL)
38	26	UPDATE BLOWER DELAY TIME	
39	27	INCREASE IN WEIGHT TIMER	(Bdt)
40	28	INCREASE IN NUMBER OF DIGITS	(Ht)
41	29	COMMS PROTOCOL	(ICA)
42	2A	CAN NOT BE WRITTEN TO	(Cp)
43	2B	UPDATE RESOLUTION	(STST)
44	2C	EEPROM ENABLE/DISABLE	(Rs)
45	2D	START BATCH	
46	2E	START NEXT MIX	
47	2F	STOP AT END OF MIX	
48	30	SET ALARM RELAY	
49	31	CLEAR ALARM RELAY	
50	32	ABORT MIX	

Response to Command 1 from ADW

Byte	
1	Station number
2,3	DISPLAY
4,5	RECIPE
6,7	SET POINT 1
8,9	IN FLIGHT 1
10,11	SET POINT 2
12,13	IN FLIGHT 2
14,15	SET POINT 3
16,17	IN FLIGHT 3
18,19	SET POINT 4
20,21	IN FLIGHT 4
22,23	SET POINT 5
24,25	IN FLIGHT 5
26,27	SET POINT 6
28,29	IN FLIGHT 6
30,31	SET POINT 7
32,33	IN FLIGHT 7
34,35	SET POINT 8
36,37	IN FLIGHT 8
38,39	SET POINT 9
40,41	IN FLIGHT 9
42,43	SET POINT 10
44,45	IN FLIGHT 10
46,47	SET POINT 11
48,49	IN FLIGHT 11
50,51	SET POINT 12
52,53	IN FLIGHT 12
54,55	BATCH TOTAL
56,57	MIXER TIMER
24,25	IN FLIGHT 5
26,27	SET POINT 6
28,29	IN FLIGHT 6
30,31	SET POINT 7
32,33	IN FLIGHT 7
34,35	SET POINT 8
36,37	IN FLIGHT 8
38,39	SET POINT 9
40,41	IN FLIGHT 9
42,43	SET POINT 10
44,45	IN FLIGHT 10
46,47	SET POINT 11
48,49	IN FLIGHT 11
50,51	SET POINT 12
52,53	IN FLIGHT 12
54,55	BATCH TOTAL
56,57	MIXER TIMER
58,59	A/D COUNTS FOR LOW CALIBRATION POINT
60,61	A/D COUNTS FOR HIGH CALIBRATION POINT
62,63	DISPLAY FOR LOW CALIBRATION POINT
64,65	DISPLAY FOR HIGH CALIBRATION POINT

66,67	DISPLAY AVERAGE	(DA)
68,69	DECIMAL POINT	(DP)
70,71	SETTLE TIME	(St) (TOL)
72,73	TOLERANCE FOR RETURN TO START WEIGHT BLOWER DELAY	(BT)
74,75	TIME	
76,77	INCREASE IN WEIGHT TIMER	
78,7	INCREASE IN NUMBER OF DIGITS	
80,81	PROTOCOL	
82,83	SDST	
84,85	RESOLUTION	
86	EEPROM ENABLE/DISABLE FLAG	
87	RELAY STATUS (RELAYS 1-8)	
88	EXOR CHECKSUM OF THE ABOVE DATA	

Response to Command 2

Byte	
1	Station number
2,3	DISPLAY READING
4,5	RESULT OF SP1
6,7	RESULT OF SP2
8,9	RESULT OF SP3
10,11	RESULT OF SP4
12,13	RESULT OF SP5
14,15	RESULT OF SP6
16,17	RESULT OF SP7
18,19	RESULT OF SP8
20,21	RESULT OF SP9
22,23	RESULT OF SP10
24,25	RESULT OF SP11
26,27	RESULT OF SP12
28	ALARM FLAG
29	BATCH COUNT
30, 31	RELAY FLAGS SEE BELOW
32, 33	GROSS
34	CHECKSUM

BW Relay Status Flags

Data Returned from Command 2 Bytes 30 & 31

Bit Number	Description
1	Ingredient 1 relay call on
2	Ingredient 2 relay call on
3	Ingredient 3 relay call on
4	Ingredient 4 relay call on
5	Ingredient 5 relay call on
6	Ingredient 6 relay call on
7	Ingredient 7 relay call on
8	Ingredient 8 relay call on
9	Ingredient 9 relay call on
10	Ingredient 10 relay call on
11	Ingredient 11 relay call on
12	Ingredient 12 relay call on
13	Ready for next mix signal
14	Mixer running
15	Do discharge
16	Batch in progress

ADW-BW Alarm Status Flags

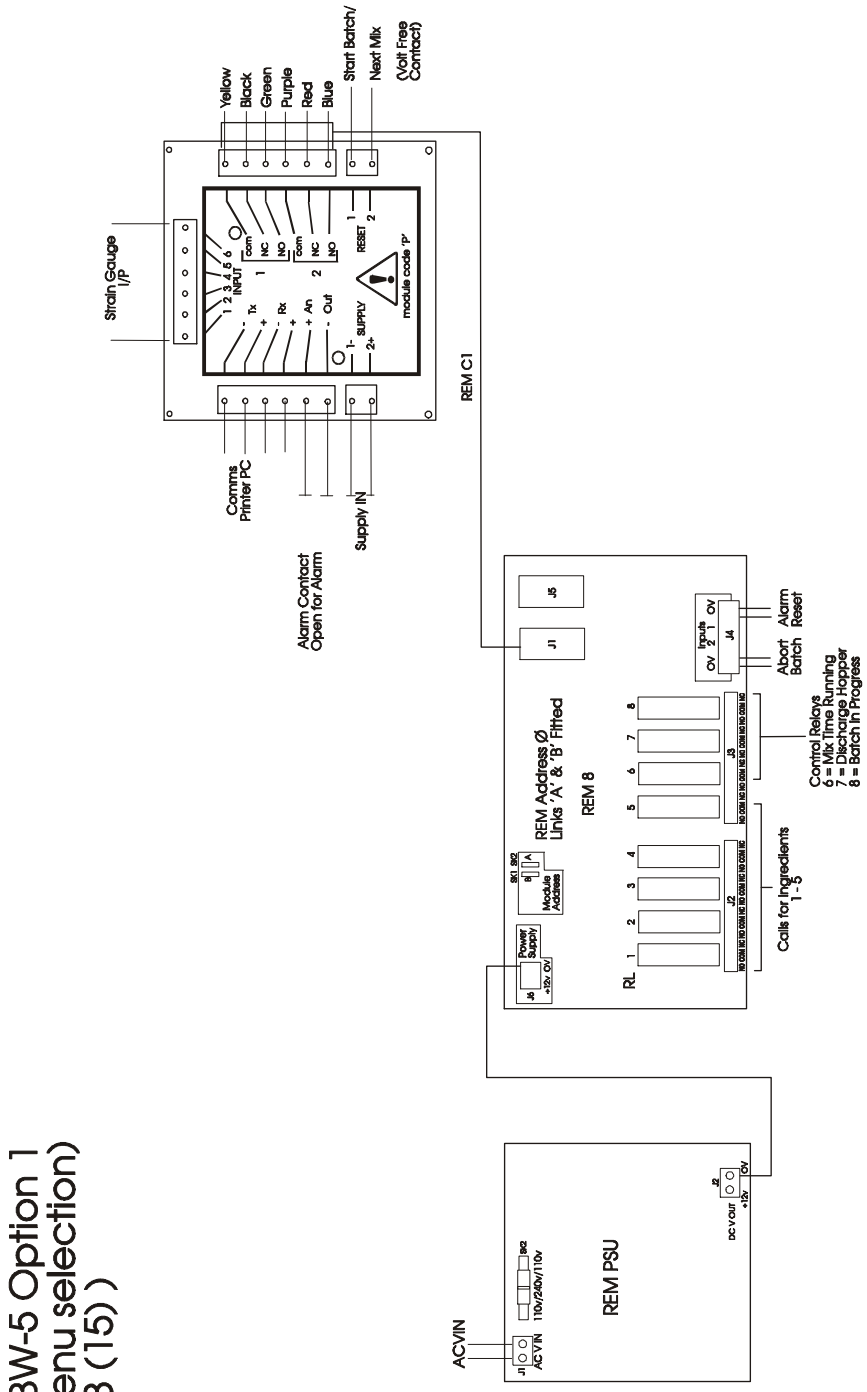
Data Returned from Command 2 Byte 28

Bit Number	Description
1	NOT USED
2	NOT USED
3	NOT USED
4	NOT USED
5	NO I2C BUS DETECTED
6	ALARM SET BY COMMAND 48
7	NO INCREASE IN WEIGHT ALARM
8	NOT USED

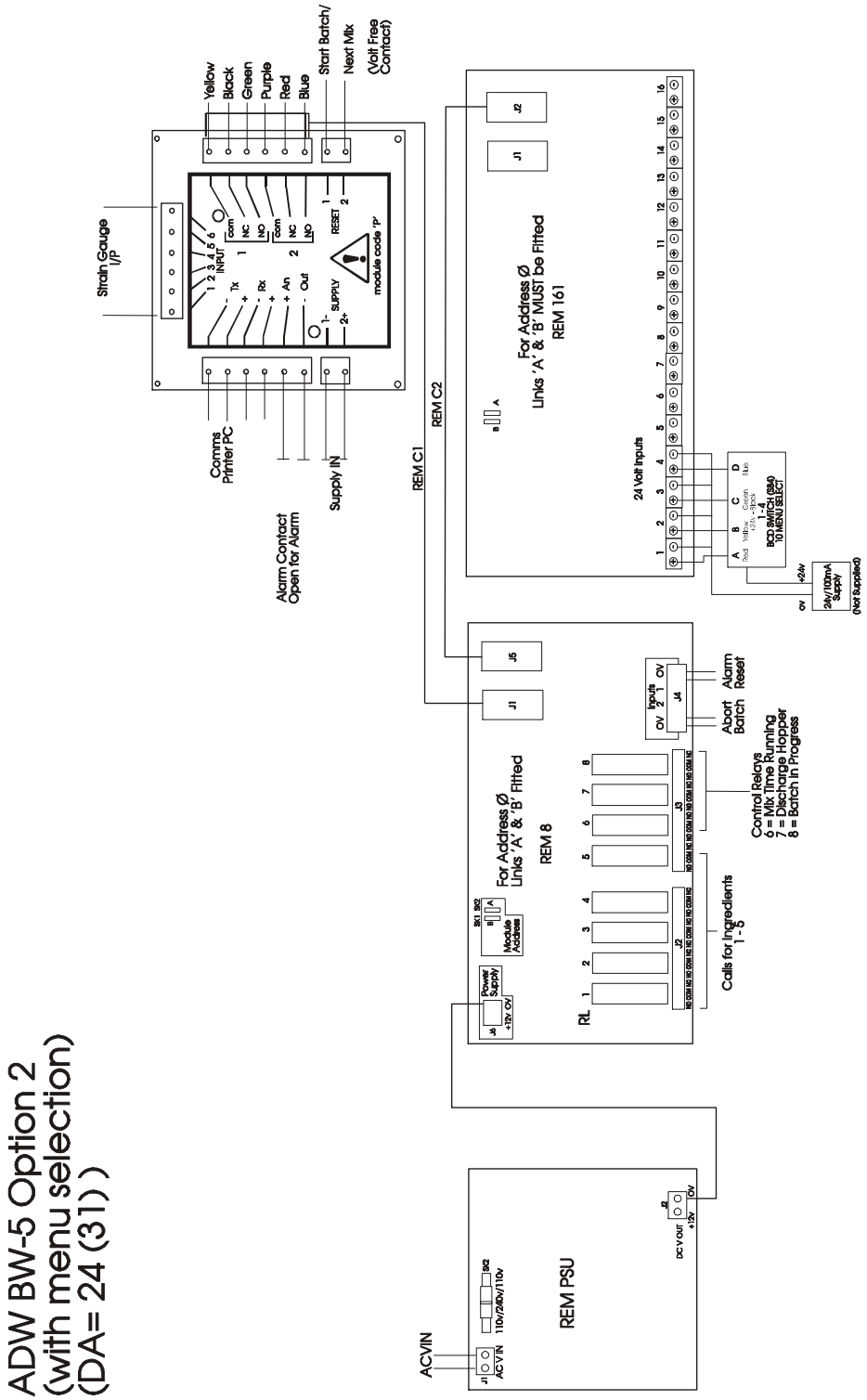
NOTES:

1. Batch count is incremented on receipt of “Next mix signal”.
2. The last mix in the batch requires a “Next mix signal” to clear the batch in progress relay.
3. The I2C alarm & no increase in weight alarm are self canceling but may be reset using command 49.
4. Recipe REC cannot be updated from the comms. It can only be set by the REM16I.

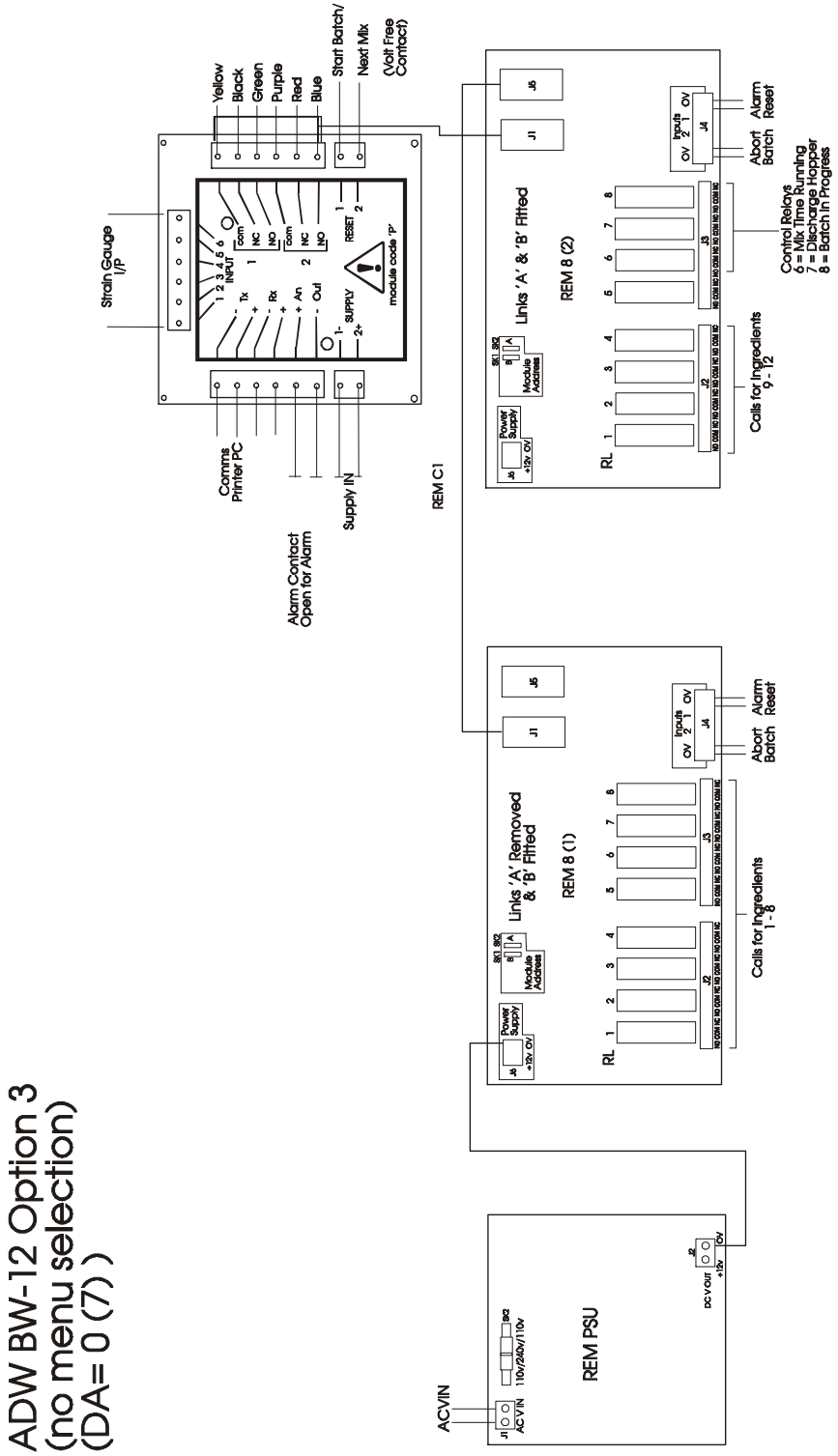
ADW BW Option 1, (no menu selection) (DA=8 (15))



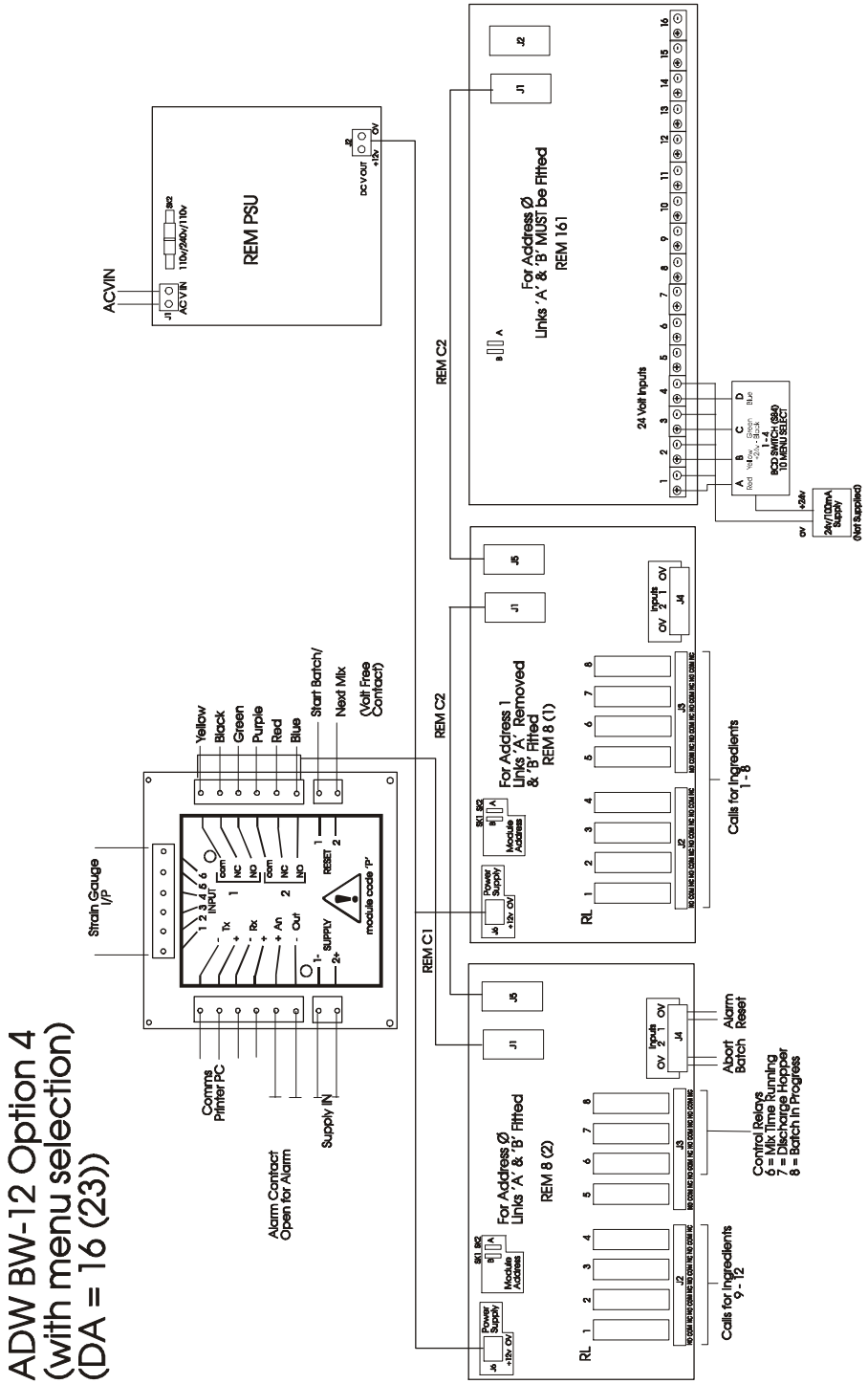
ADW BW Option 2, (with menu selection (DA=24 (31))



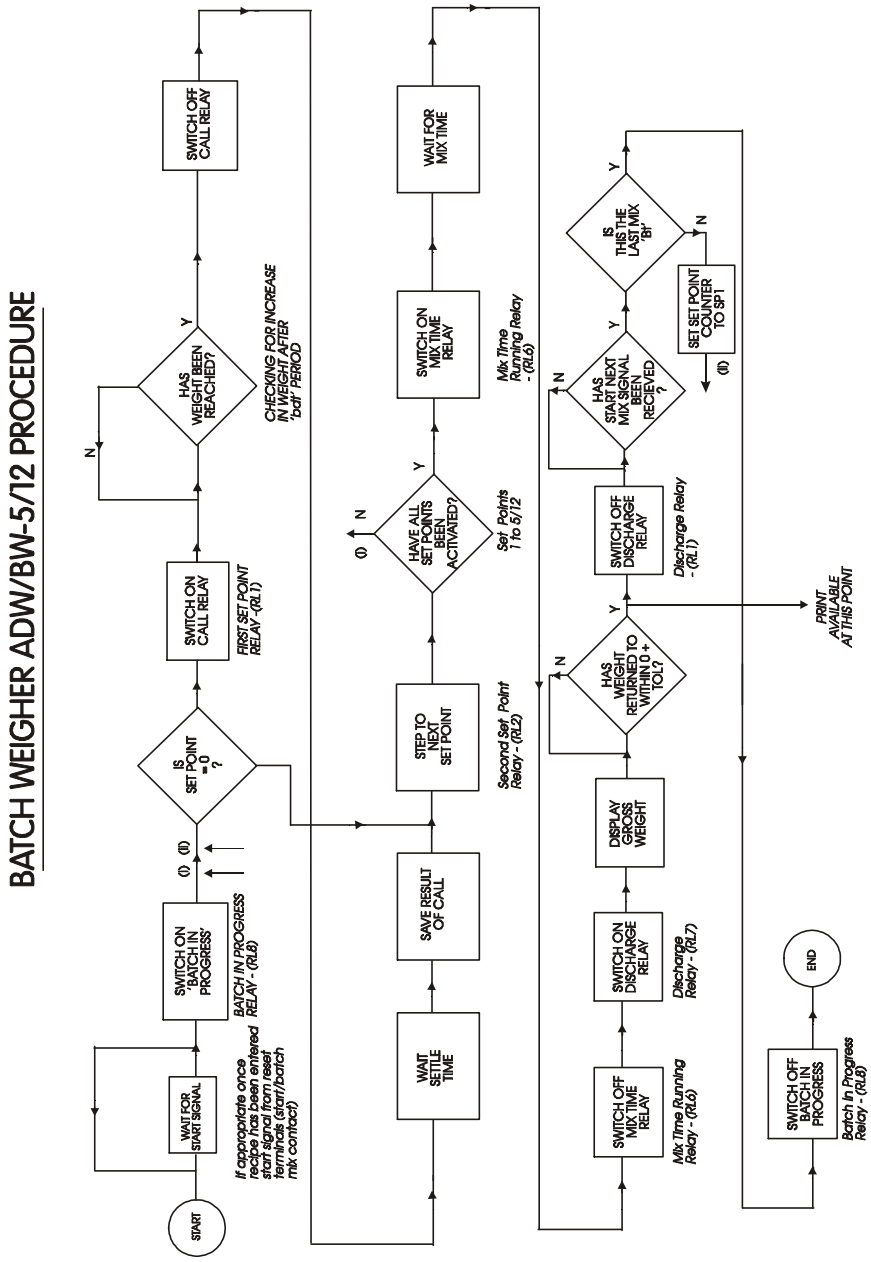
ADW BW Option 3, (no menu selection (DA= 0 (7))



ADW BW Option 4, (with menu selection (DA = 16 (23))



Batch Weigher ADW/BW Procedure



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All ADW products from Mantracourt Electronics Ltd., ('Mantracourt') are warranted against defective material and workmanship for a period of (3) three years from the date of dispatch.
If the 'Mantracourt' product you purchase appears to have a defect in material or workmanship or fails during normal use within the period, please contact your Distributor, who will assist you in resolving the problem. If it is necessary to return the product to 'Mantracourt' please include a note stating name, company, address, phone number and a detailed description of the problem. Also, please indicate if it is a warranty repair.
The sender is responsible for shipping charges, freight insurance and proper packaging to prevent breakage in transit.
'Mantracourt' warranty does not apply to defects resulting from action of the buyer such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorised modification.
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Any corrective maintenance required after the warranty period should be performed by 'Mantracourt' approved personnel only.

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CE In the interests of continued product development, Mantracourt Electronics Limited reserves the right to alter product specifications without prior notice.

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